marconi instruments

6140

GPIB ADAPTOR

MARCONI COMMAND AND
CONTROL SYSTEMS LTD
Blackbird Road
Leicester

RETURN TO TEST
EQUIPMENT SECTION

Instruction Manual

MP MASTER
MA23593

GPIB Adaptor 6140

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MARCONI INSTRUMENTS LIMITED
MICROWAVE PRODUCTS DIVISION
(formerly Sanders Division)
STEVENAGE HERTFORDSHIRE ENGLAND
A GEC-MARCONI ELECTRONICS COMPANY

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Note...

Each page bears the date of the original issue or the code number and date of the latest amendment (Am. 1, Am. 2 etc.). New or amended material of technical importance introduced by the latest amendment is indicated by triangles positioned thus ▶.....◀ to show the extent of the change. When a chapter is reissued the triangles do not appear.

Any changes subsequent to the latest amendment state of the manual are included on inserted sheets coded C1, C2 etc.

NOTES AND CAUTIONS

SAFETY PRECAUTIONS

This equipment is protected in accordance with IEC Safety Class 1. It has been designed and tested according to IEC Publication 348, 'Safety Requirements for Electronic Measuring Apparatus', and has been supplied in a safe condition. The following precautions must be observed by the user to ensure safe operation and to retain the equipment in a safe condition.

Defects and abnormal stresses

Whenever it is likely that protection has been impaired, for example as a result of damage caused by severe conditions of transport or storage, the equipment shall be made inoperative and be secured against any unintended operation.

Removal of covers

Removal of the covers is likely to expose live parts, although reasonable precautions have been taken in the design of the equipment to shield such parts. The equipment shall be disconnected from the supply before carrying out any adjustment, replacement or maintenance and repair during which the equipment shall be opened. If any adjustment, maintenance or repair under voltage is inevitable it shall only be carried out by a skilled person who is aware of the hazard involved.

Note that capacitors inside the equipment may still be charged when the equipment has been disconnected from the supply. Before carrying out any work inside the equipment, capacitors connected to high voltage points should be discharged; to discharge mains filter capacitors, if fitted, short together the L (live) pins of the mains plug.

Mains plug

The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. The protective action shall not be negated by the use of an extension lead without protective conductor. Any interruption of the protective conductor inside or outside the equipment is likely to make the equipment dangerous.

Fuses

Note that there is a supply fuse in both the live and neutral wires of the supply lead. If only one of these fuses should rupture, certain parts of the equipment could remain at supply potential.

To provide protection against breakdown of the supply lead, its connectors, and filter where fitted, an external supply fuse (e.g. fitted in the connecting plug) should be used in the live lead. The fuse should have a continuous rating not exceeding 6A.

Make sure that only fuses with the required rated current and of the specified type are used for replacement. The use of mended fuses and the short-circuiting of fuse holders shall be avoided.

CAUTION... Static Sensitive Components

Components identified with the symbol on the circuit diagrams and/or parts lists are static sensitive devices. The presence of such devices is also indicated in the equipment by orange discs, flags or labels bearing the same symbol. Certain handling precautions must be observed to prevent these components being permanently damaged by static charges or fast surges.

(1) If a printed board containing static sensitive components (as indicated by a warning disc or flag) is removed, it must be temporarily stored in a conductive plastic bag.

(2) If a static sensitive component is to be removed or replaced, the following anti-static equipment must be used:

A work bench with an earthed conductive surface.

Metallic tools earthed either permanently or by repeated discharges.

A low-voltage earthed soldering iron.

An earthed wrist strap and a conductive earthed seat cover for the operator, whose outer clothing must not be of man-made fibre.

(3) As a general precaution, avoid touching the leads of a static sensitive component. When handling a new one, leave it in its conducting mount until it is required for use.

WARNING... Handling Hazards

This equipment is formed from metal pressings and although every endeavour has been made to remove sharp points and edges, care should be taken, particularly when servicing the equipment, to avoid minor cuts.

WARNING... Toxic Hazard

Many of the electronic components used in this equipment employ resins and other chemicals which give off toxic fumes on incineration. Appropriate precautions should therefore be taken in the disposal of these items.

Chapter 1

GENERAL INFORMATION

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13 Specification

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1 GPIB Adaptor 6140 1

INTRODUCTION

1. The 6140, Figure 1, is an adaptor unit which will interface between the instrument bus (GPIB, HP-IB, IEEE 488) and existing or new non-bus programmable instruments. The unit can interface commands from the bus to the instrument, that is, listen; it will not transmit readings back onto the bus. The range of control of an instrument will depend on which electrically controllable functions are accessible on that instrument. The adaptor is sufficiently flexible to perform many non-instrument and non-microwave applications. A number of analogue and digital outputs are provided; each output is internally stored and is continuously available as an output.

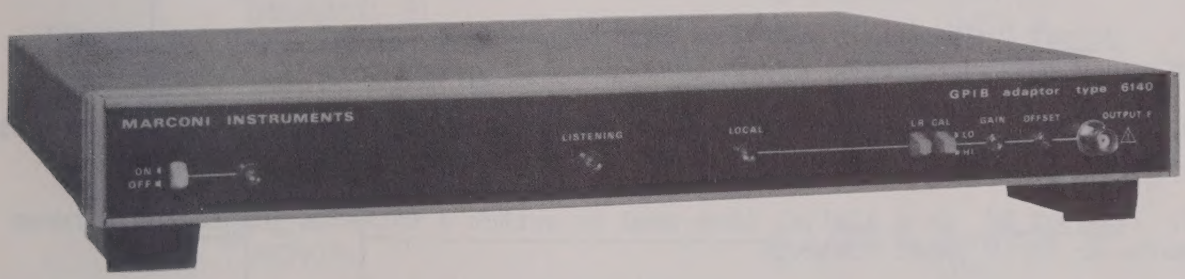

Fig. 1 GPIB Adaptor 6140

2. The outputs are summarised in the following paragraphs and reference to the block diagram, Figure 2, will show the inter-relationship between outputs where appropriate (e.g. F+ and F-).

3. Output F+ is a programmable 0 to +nV analogue voltage (where n is normally set to a nominal +10V by an internally selected resistor, but can be made as high as +20V by merely changing the value of this resistor); the voltage is settable in 10000 steps. The output is primarily intended to control frequency on generators with an external sweep input, e.g. Marconi Instruments Types 6700 and 6158A etc., and can also be used with instruments requiring other than 0 to 10V, e.g. Marconi Instruments 6600A using 0 to 20V. Front panel calibration controls enable the programmable frequency range to be accurately set, regardless of the generator used. A second output (F-) of 0 to -10V is available.

4. Output Ld (Level, digital) is a programmable 3 digit BCD logic output (12 lines) which is CMOS/TTL compatible. The digital outputs can be used in any controlling function, but are primarily intended to drive BCD programmable attenuators, in or out of instruments.

5. Output La+ (Level, analogue) is a programmable analogue voltage of 0 to 10V in 1000 steps; a second output La- is also available.

6. Output LI is a programmable 0 to 50mA (nominal) current intended to drive, for example, PIN modulators in or out of instruments. This output is also simultaneously available with La+.

7. Output JR (Relays) is 4 programmable fully floating change-over relays that can be used for high level interfacing and driving, for example, the HP 8490 attenuator or for signal routing. For example, output F+ could be switched between four destinations.

8. Output Jd (digital) is four independent digital lines, TTL/CMOS compatible, that are used for driving the relays, Para. 7 refers. They can be used as general control lines if the relays are not used.

9. Output C (Control) provides four independent digital lines for general control of BCD equipment.

10. Output P (Power) is the internal power supplies brought out for interfacing. All supplies are fully protected.

11. Output RM is a digital line used to switch a suitable instrument between remote or front panel control.

12. Additional DELIM & NDAC lines are provided for handshake between the 6140 and the equipment under control when the bus data arrives too fast for that equipment.

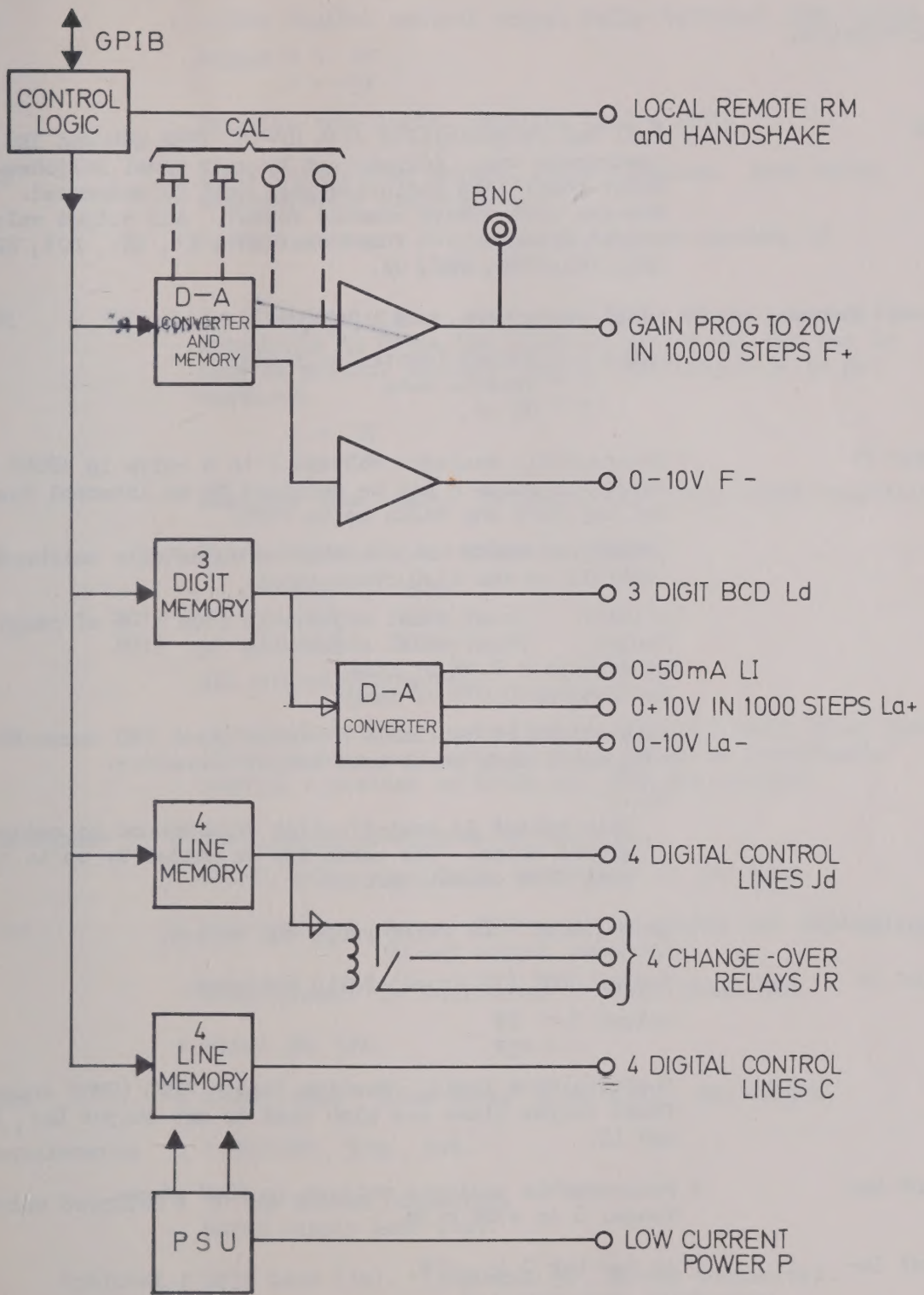

Fig. 2 6140 Block Diagram

SPECIFICATION

13.

GPIB : Full bus compatibility with HP-IB, IEEE 488 and IEC 625-1 instrument bus. Address set by rear panel switches. Front panel lamp indicates when unit is addressed. Standard Marconi Instruments command format. All output values are stored internally. Functions: AH1, L1, RL1, DC1, SHØ, TØ, LEØ, SR0, PPØ, DTØ, CØ.

Command Format : ASCII characters, ~~"X,N,N,N,CR"~~ "XNNNCR"

where X = Output identifier letter
N = Numeric data
CR = CR or,

Output F+ : Programmable analogue voltage 0 to n volts in 10000 steps, where the value n may be selected by an internal resistor and may have any value up to +20V.

OFFSET and RANGE are screwdriver adjustable calibration controls on the 6140 front panel.

Offset: front panel adjustable from ±10% of range
Range: Front panel adjustable by ±10%
Linearity: ± 0.1% of range
Resolution: ±0.01% of range

This output is available at front panel BNC connector as well as at rear panel main output connector.

NB...
This output is semi-floating from ground to reduce ground noise. The earth may be pulled by up to ±0.4V away from chassis ground.

Output F- : As F+, 0 to -10V fixed range and offset.

Output Ld : 3 digit BCD (12 lines) fully buffered.

Output 0 = 0V
1 = +5V

Positive true logic. Maximum load = 2TTL (CMOS compatible). These output lines are also used to set output La+, La- and LI.

Output La+ : Programmable analogue voltage in 1000 steps.
Range: 0 to +10V ± 1%.

Output La- : As La+ but 0 to -10V.

Output LI : Programmable analogue current 0-50mA nominal derived from La+.

The data for La+, La- and LI is derived from output Ld.

Maximum output voltage of LI +4V.

Output C : 4 line digital control output fully buffered, BCD format.

Output 0 = 0V
1 = +5V

Positive true logic. Maximum load = 2TTL.

Putput JR : 4 off change-over relays, fully floating. Each relay independently controllable.

Contact rating: 28V, 0.5A, limited to maximum 3W dissipation.

Output Jd : 4 off digital lines, fully buffered. These are used internally to drive the relay of output JR, but may be used as general digital outputs when output JR is not required.

0 = 0V
1 = +5V

Positive true logic: Maximum load = 2TTL (CMOS compatible).

Output P : Power output for interface circuits.

+15V	150mA
-15V	150mA
+ 5V	300mA

All outputs protected.

Output RM : Local/remote line controlled by GPIB and front panel control. Allows remote switching in BCD controlled instruments. Logical operation as HP-IB and IEEE bus systems.

Output Handshake : NDAC, stops acceptance of bus data.

DELIM, pulse signifying acceptance of new data.

Connectors : Rear panel: 24 way GPIB input connector for IEEE-488.
50 way output connector.

Front panel: F+ duplicated on front panel BNC.

Safety : Meets IEC 348.

Dimensions : 420mm wide, 340mm deep, 40mm high. 3kg weight.

Power Requirements : 115V/230V, 50Hz, 20W.

Accessories Supplied : 50 way Ribbon Connector.
Mains supply lead (1m).

Optional : GPIB Lead (1m). (Amphenol 57, 24 way connector). Ordering Code 43129-189U.

: IEC/IEEE Adaptor. Ordering Code 46883-408K.

: Rack Mounting Kit. Ordering Code 3963-029.

Chapter 2

INSTALLATION

CONTENTS

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1 Unpacking
2 Mains supply connection
3 Mains lead
4 Repacking for shipment

UNPACKING

1. Each 6140 GPIB adaptor is shipped in a specially designed carton with shock-absorbing packing material between the instrument and the carton. Use normal care when unpacking the instrument and removing the packing material. Do not destroy the carton or packing material until the equipment is thoroughly inspected. If damage is found, notify the carrier immediately and do not destroy any packing material until an agent of the carrier has examined it.

MAINS SUPPLY CONNECTION

2. The instrument may be operated from an a.c. supply in the range 100 to 125 V or 200 to 250 V at 50 Hz. With the mains lead disconnected, move the 230 V/115 V switch (located on the rear panel), having first removed the locking plate, to the desired voltage range. Replace the locking plate, appropriately orientated. The fuses on the rear panel must be 500 mA for an input voltage of 115 V and 250 mA for 250 V.

Mains lead

3. The instrument is supplied with a one metre, three-conductor mains lead which, when plugged into an appropriate receptacle, grounds the instrument cabinet.

REPACKING FOR SHIPMENT

4. To protect the instrument during reshipment always use the best packaging methods available. When possible, use the original packing container and cushioning material. If the original packing materials are not available, use the following procedure:

(1) Wrap instrument in sturdy paper or plastic.

(2) Place wrapped instrument in a strong shipping container; use a 20 mm layer of shock absorbing material around all sides of the unit to provide a firm cushion to prevent movement inside the container.

(3) Thoroughly seal shipping container and mark it as "FRAGILE".

(4) If shipping for service, attach a note to indicate:

a) Service required.

b) Description of malfunction.

c) Type and serial numbers.

Chapter 3

OPERATION

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1 Programme codes
2 Front panel connection
3 Rear panel connection
4 Operator checks
5 Applications

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PROGRAMME CODES

1. 6140 has full compatibility with HP-IB, IEEE 488 and IEC 625-1 (using Adaptor 46883-408K). The GPIB Address is set by switches on the rear panel, Fig. 5 refers. The front panel lamp indicates when the 6140 is addressed. Command format is standard Marconi Instruments GPIB. All output values are stored internally. Functions available are: AH1, L1, RL1, DC1, SHØ, TØ, LEØ, SRØ, PPØ, DTØ, CØ.

The Command format is:

"X N N N N CR" (NO SPACES)

where X is Output identifier letter (F, L, J, etc.)
N is ASCII character (dependent on output required)
CR is CR or ,

Output identifier is latched for following data until new output identifier is called up.

For convenience the ASCII characters are listed in Fig. 1, together with the appropriate digital codes for BCD, relays and analogue outputs where applicable. Referring to Fig. 2, the interrelationship between the outputs is shown.

ASCII Character	Digital Outputs D C B A (JR RELAYS)	Analogue Output (F,L)
0	0 0 0 0	0V
1	0 0 0 1	1V
2	0 0 1 0	2V
3	0 0 1 1	3V
4	0 1 0 0	4V
5	0 1 0 1	5V
6	0 1 1 0	6V
7	0 1 1 1	7V
8	1 0 0 0	8V
9	1 0 0 1	9V
:	1 0 1 0	10V
;	1 0 1 1	11V
<	1 1 0 0	12V
=	1 1 0 1	N/A
>	1 1 1 0	N/A
?	1 1 1 1	N/A

Fig. 1 ASCII character codes

"F N N N N CR"

Output F+ Programmable analogue voltage 0 to +nV in 10000 steps, where the value n may be selected by an internal resistor, and may have any value up to +20V. Offset and range adjustable.

NB...
This output is semi-floating from ground to reduce ground noise.

Output F- As F+, 0 to -10V fixed range and offset.

"L N N N CR" Drives Ld, La+, La- and LI simultaneously.

Output Ld 3 digit BCD (12 lines) fully buffered.

Output 0 = 0V
Output 1 = +5V

Output La+ Programmable analogue voltage in 1000 steps.

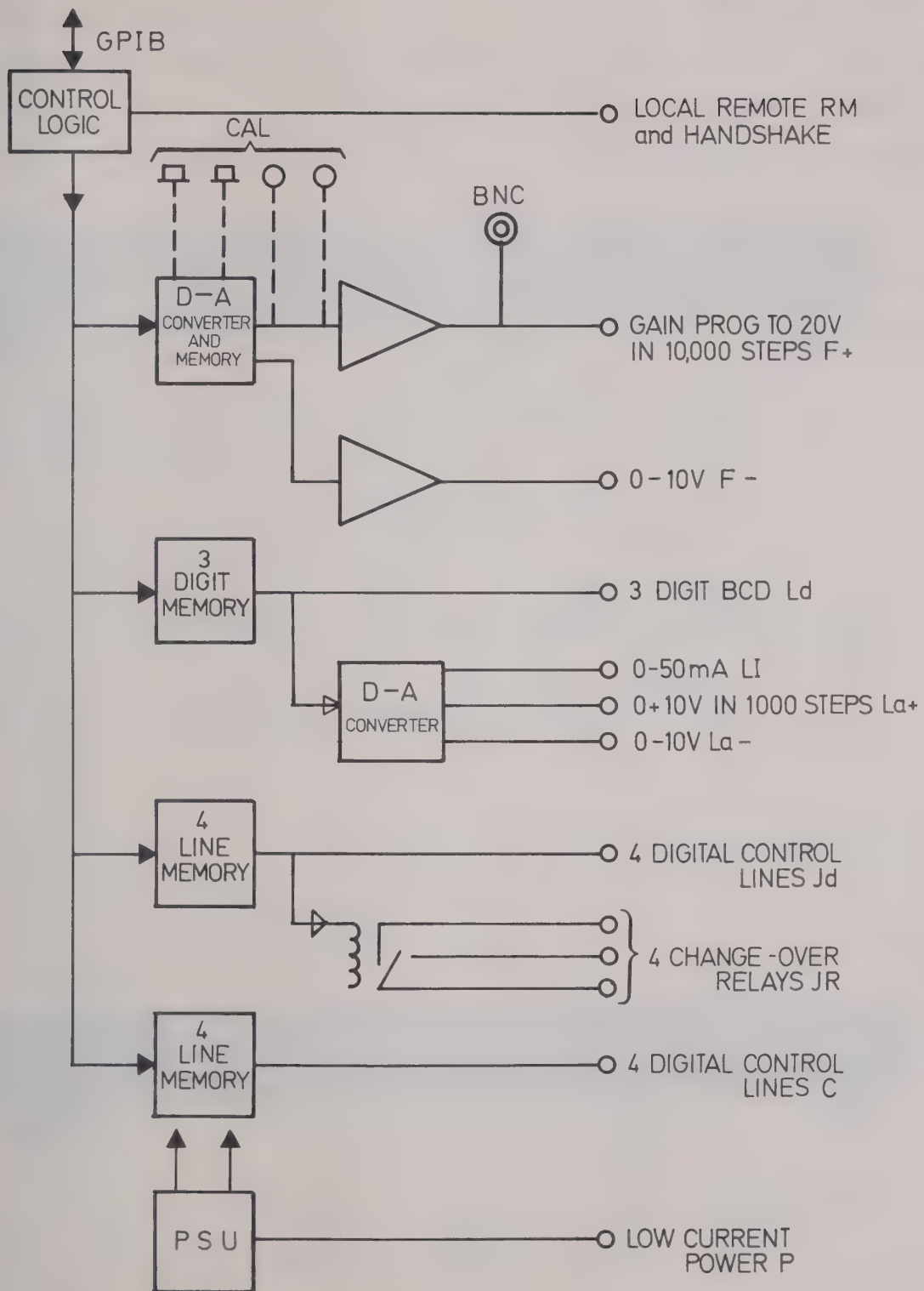


Fig. 2 6140 Block Diagram

Output La- As La+ but 0 to -10V.

Output LI Programmable analogue current 0 to 50mA nominal derived from La+.

"C N CR"

Output C 4 line digital control output fully buffered, BCD format

Output 0 = 0V
Output 1 = +5V

"J ,N ,CR" Drives JR and Jd simultaneously.

Output JR 4 off change-over relays, fully floating. Each relay independently controllable. Maximum load 3W, 28V, 0.5A. Link Pin 19 to Pin 44 of 50 way output connector SK3.

When switching complex inductive loads, series CR networks should be added across the load. Values are calculated from the approximate formulas:

$C = I^2$ 100μF where load current I is in Amp.

$R = E/(10\ I\ r)$ ohm where supply voltage E is in Volt.

$r = 1 + 50/E$.

Typical values are R = 220 ohm, C = 0.1 to 1μF.

Output Jd 4 off digital lines, fully buffered. These are used internally to drive the relays of output JR, but may be used as general digital outputs when output JR is not required.

2. FRONT PANEL CONNECTIONS

Fig. 3 Front Panel Controls

Adjust OFFSET for zero volts at output F. With CAL button OUT, GAIN may be adjusted approximately 10% using the screwdriver adjustment to the required range, and with the CAL button IN, OFFSET may be adjusted approximately 10% to the required level.

3. REAR PANEL CONNECTIONS

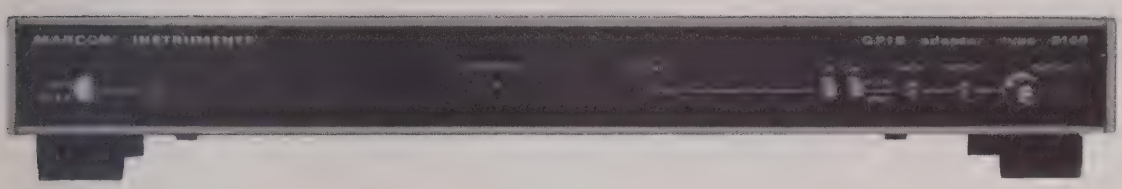


Fig. 4 Rear Panel Connections

Details of GPIB address switch setting are shown in Fig. 5. Connection details for SK3, 50 way output connector, and SK4 GPIB connector, are shown in Figs. 6 and 7.

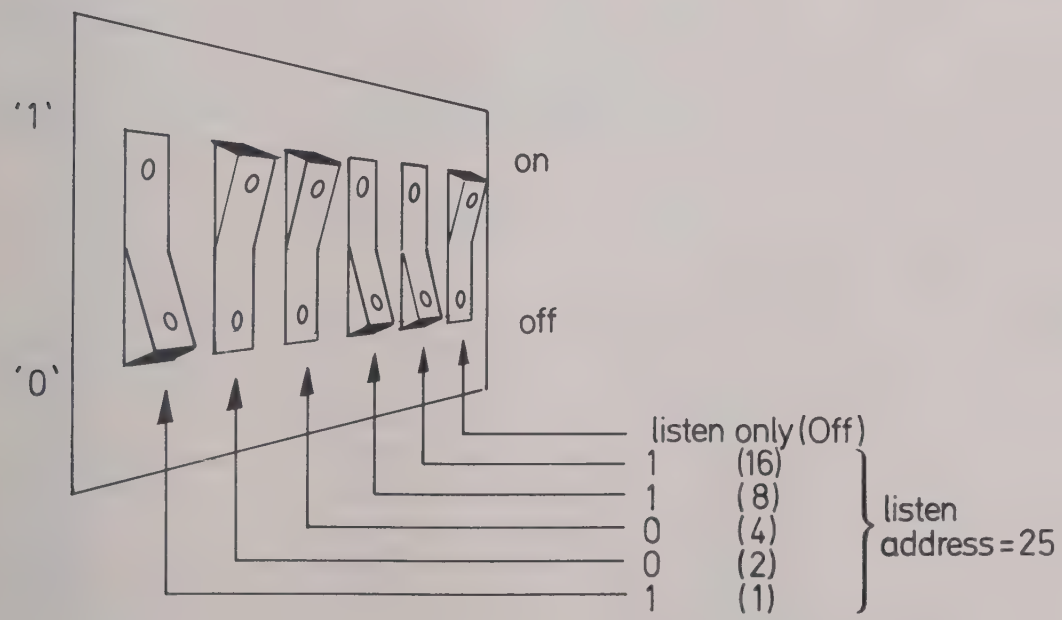


Fig. 5 GPIB Address Switch

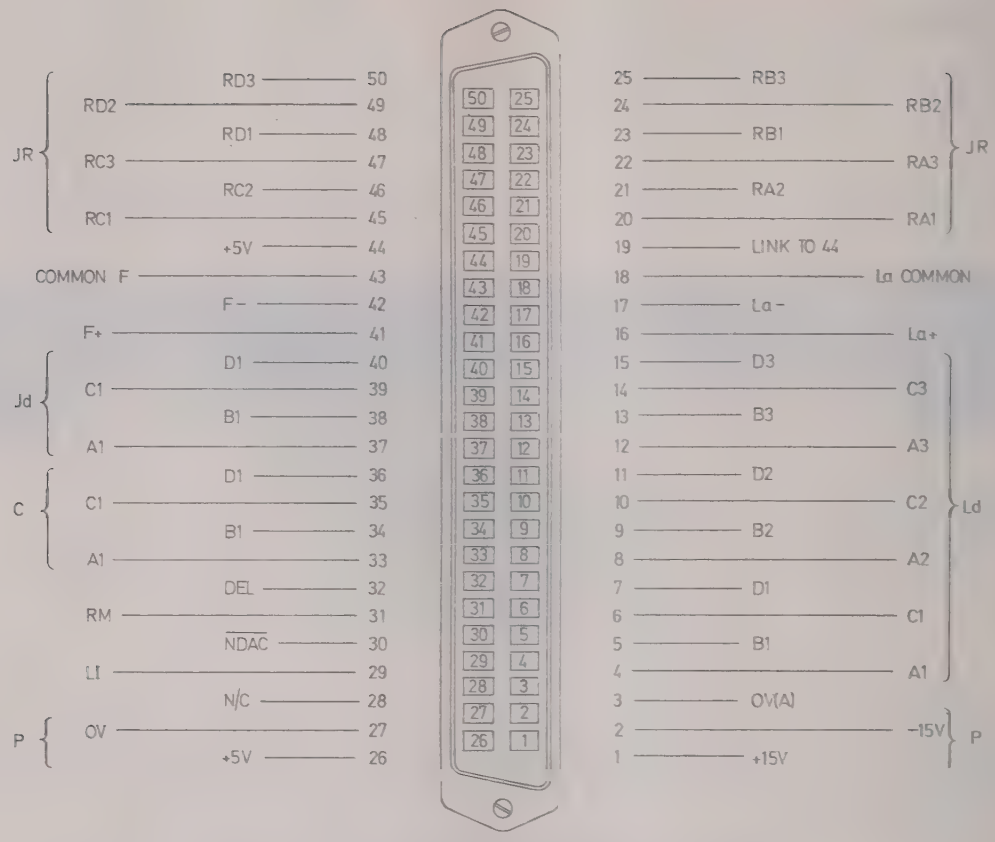


Fig. 6 50 way Output Connector SK3

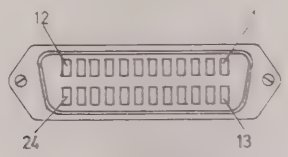


Fig. 7 GPIB Connector SK4

Connector Contact Assignments

Contact	Signal Line	Contact	Signal Line
1	D101	13	D105
2	D102	14	D106
3	D103	15	D107
4	D104	16	D108
5	EOI	17	REN
6	DAV	18	Gnd (6)
7	NRFD	19	Gnd (7)
8	NDAC	20	Gnd (8)
9	IFC	21	Gnd (9)
10	SRQ	22	Gnd (10)
11	ATN	23	Gnd (11)
12	SHIELD	24	Gnd (LOGIC)

Gnd(n) refers to return of referenced circuit

OPERATOR CHECKS

4. (1) Check setting of the power supply voltage selector.

(2) Check fuses:- 500mA Time Delay for 115V.
or 250mA Time Delay for 230V.

(3) Switch ON and check that LOCAL and Supply Lamps are illuminated.

(4) Set GPIB ADDRESS switch - See Fig. 5.

(5) Address instrument - check that LOCAL lamp goes out and LISTENING lamp lights while handshake is in progress.

(6) Press LOCAL REQUEST (L R) - LOCAL lamp should light and instrument return to LOCAL.

APPLICATIONS

5. In addition to driving various equipments produced by Marconi Instruments Microwave Products Division, the GPIB Adaptor 6140 can be used for general bus control of non-instrument and non-microwave equipment. The design gives maximum flexibility for minimum cost. The following show some of the applications of the GPIB Adaptor Type 6140.

GPIB Control of Frequency Output of Sweep Generators

Any generator that can be remotely controlled by an external voltage can be made GPIB compatible. Fig. 8 shows a typical application where the frequency of a Signal Source is controlled from the data bus.

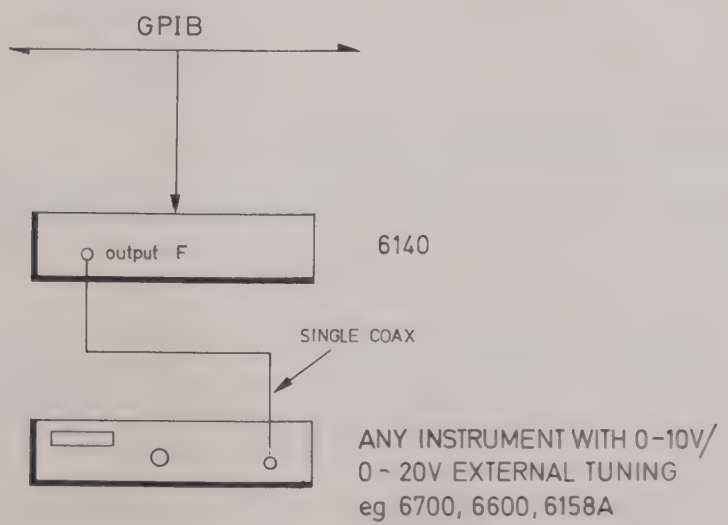


Fig. 8 GPIB Controlled Frequency

Fine RF Level Control by GPIB

By controlling the bias to a PIN modulator at the output of a generator (either internally, as in the Marconi Instruments 6150, 6700 etc., or externally) the output power can be controlled over narrow limits. See Figs. 9 and 17. When using voltage controlled PIN modulators, outputs La+ or La- are used, however for current controlled modulators, output LI is used.

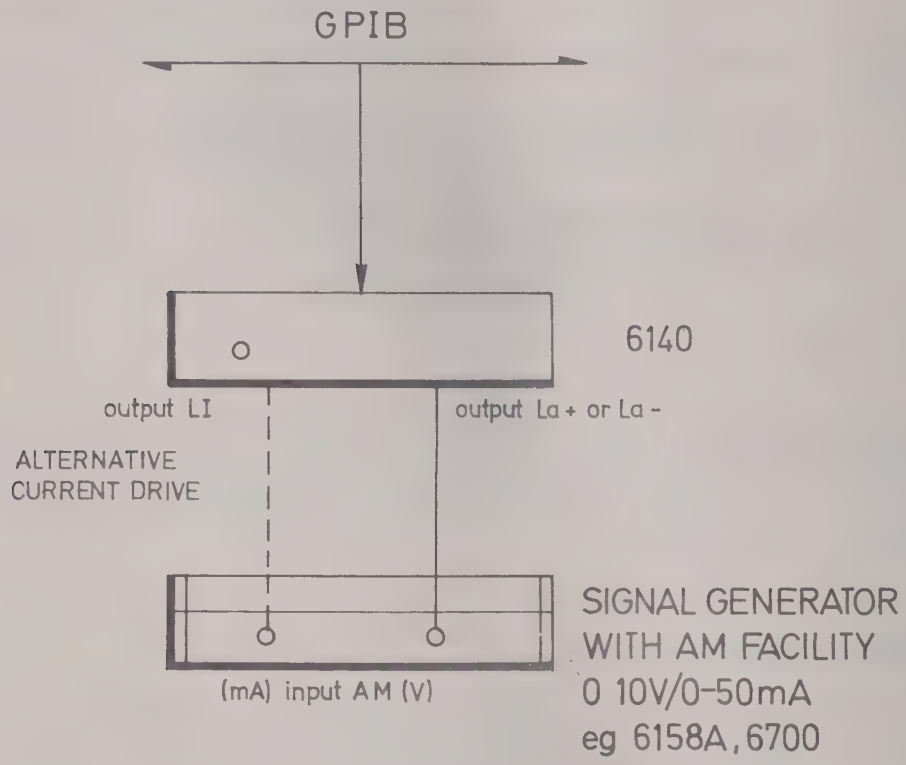


Fig. 9 GPIB Control of RF Level

BCD Controllable Instruments on the GPIB

The Type 6140 will make BCD programmable instruments fully bus compatible. Fig. 10 refers.

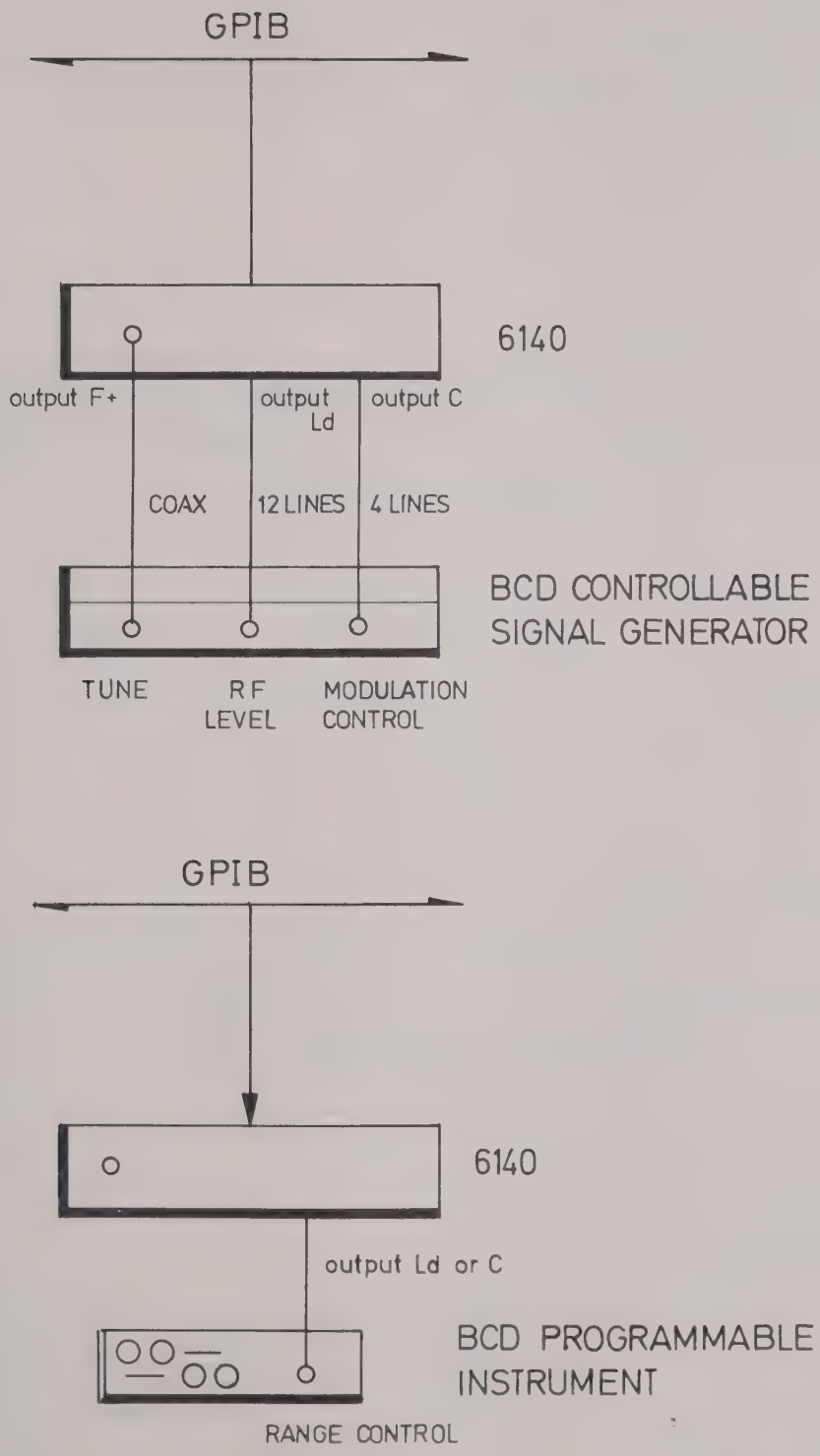


Fig. 10 GPIB Control of BCD Controllable Instruments

GPIB Controlled Attenuators

Using the Type 6140; PIN attenuators, as well as programmable step attenuators, can be made fully GPIB programmable. See Fig. 11.

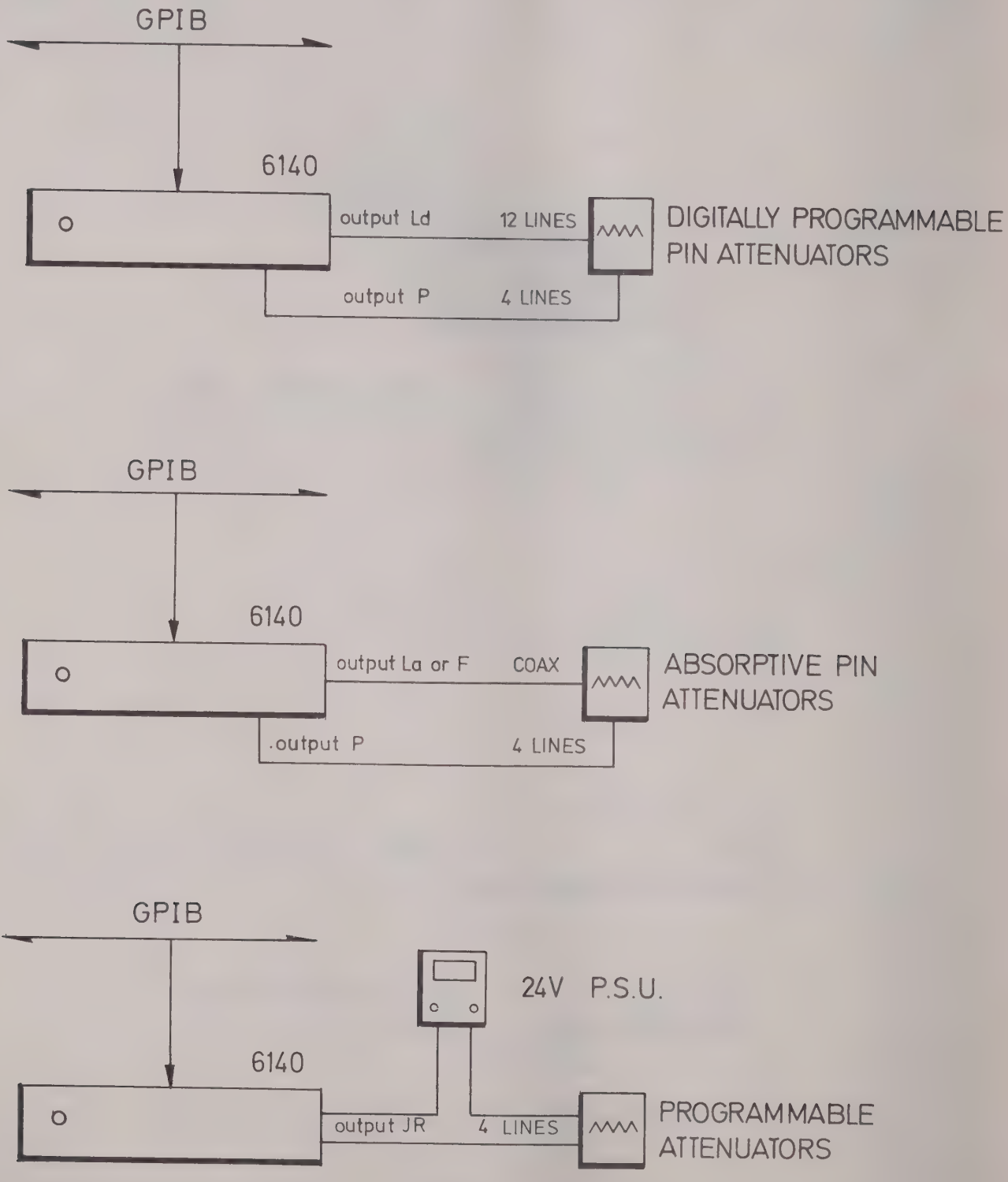


Fig. 11 GPIB Attenuator Control

GPIB Control of Multiplexing for RF and Analogue Signals

Figs. 12 and 13 give details of system solutions for multiplexing RF or analogue signals as well as data selection.

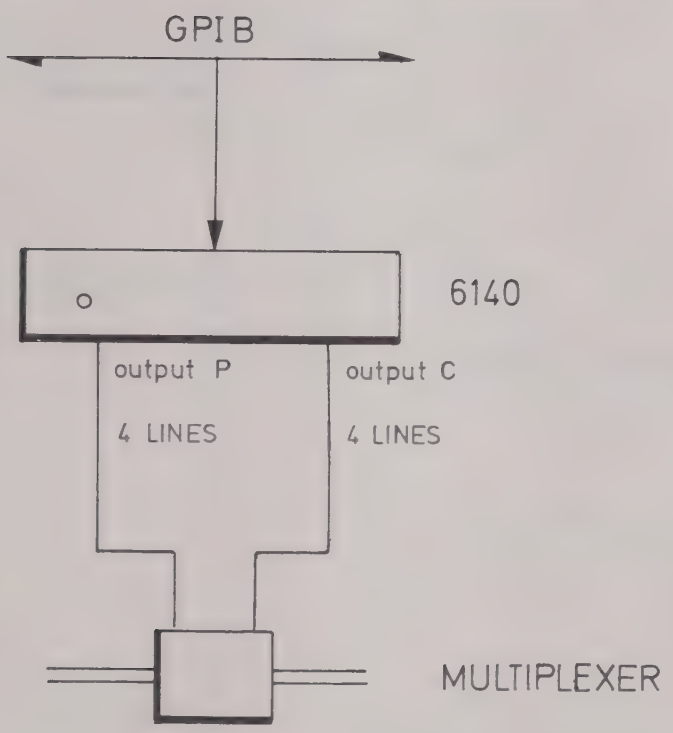
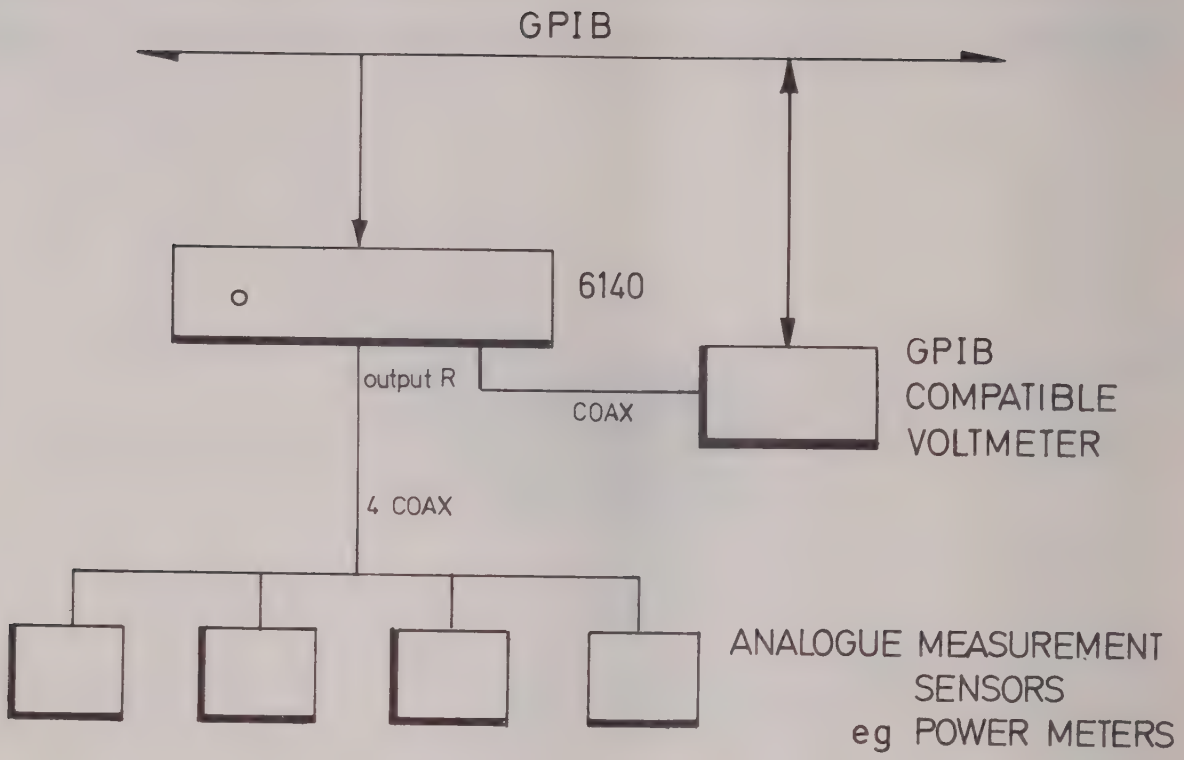


Fig. 12 GPIB Control of RF Multiplexing



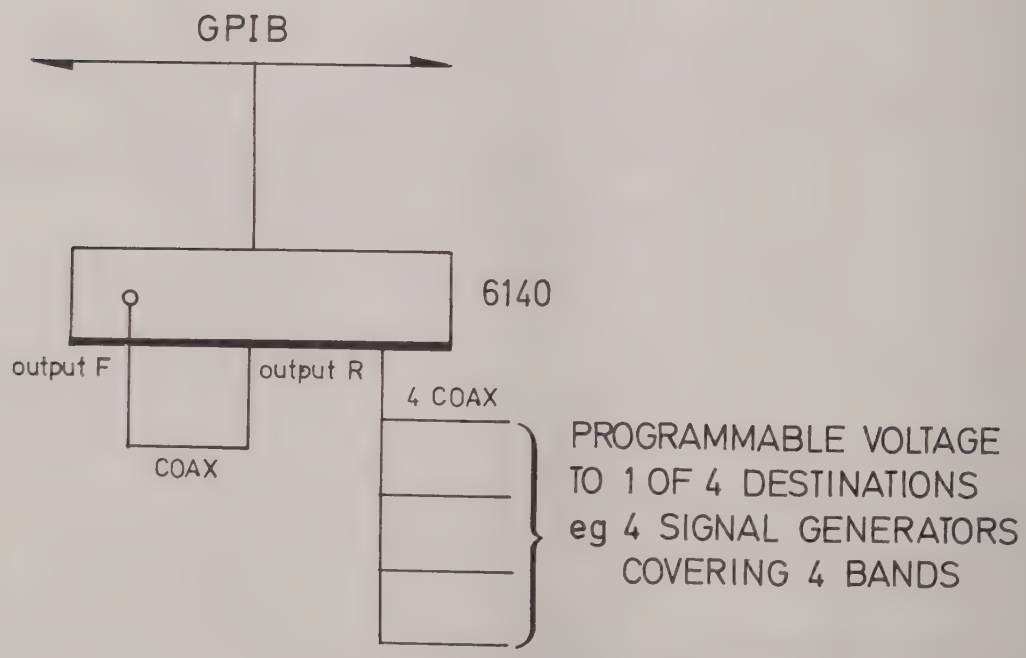


Fig. 13 GPIB Controlled Analogue Multiplexer and Data Selector

Manual Plotters and GPIB

With a Type 6140 GPIB Adaptor it is possible to drive any manual XY plotter from GPIB control line.

BCD programmable recorders and printers (HP5055, WEYFRINGE 400) can be made GPIB compatible with the Type 6140. See Fig. 14.

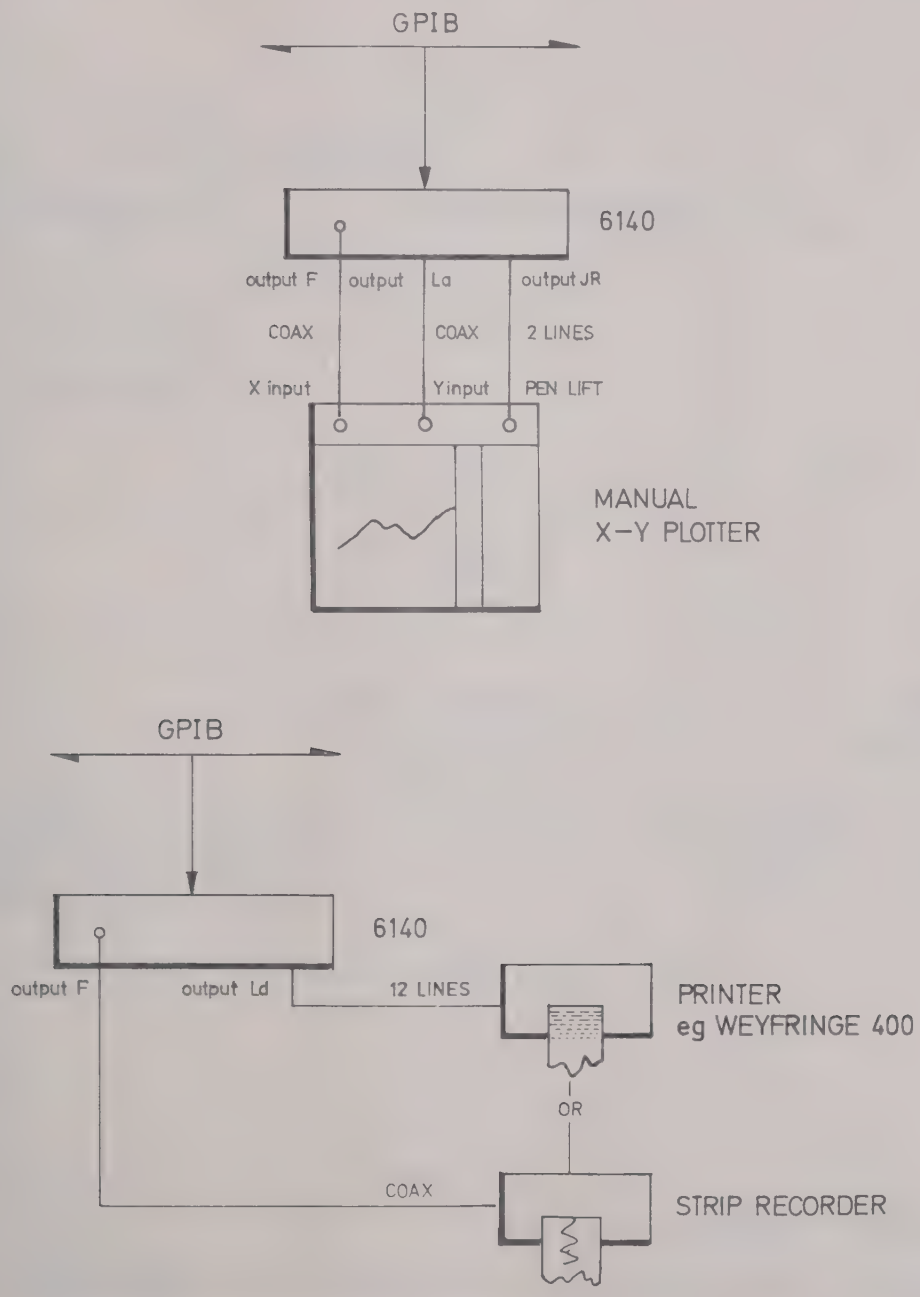


Fig. 14 GPIB Control of Manual Plotter or Recorder

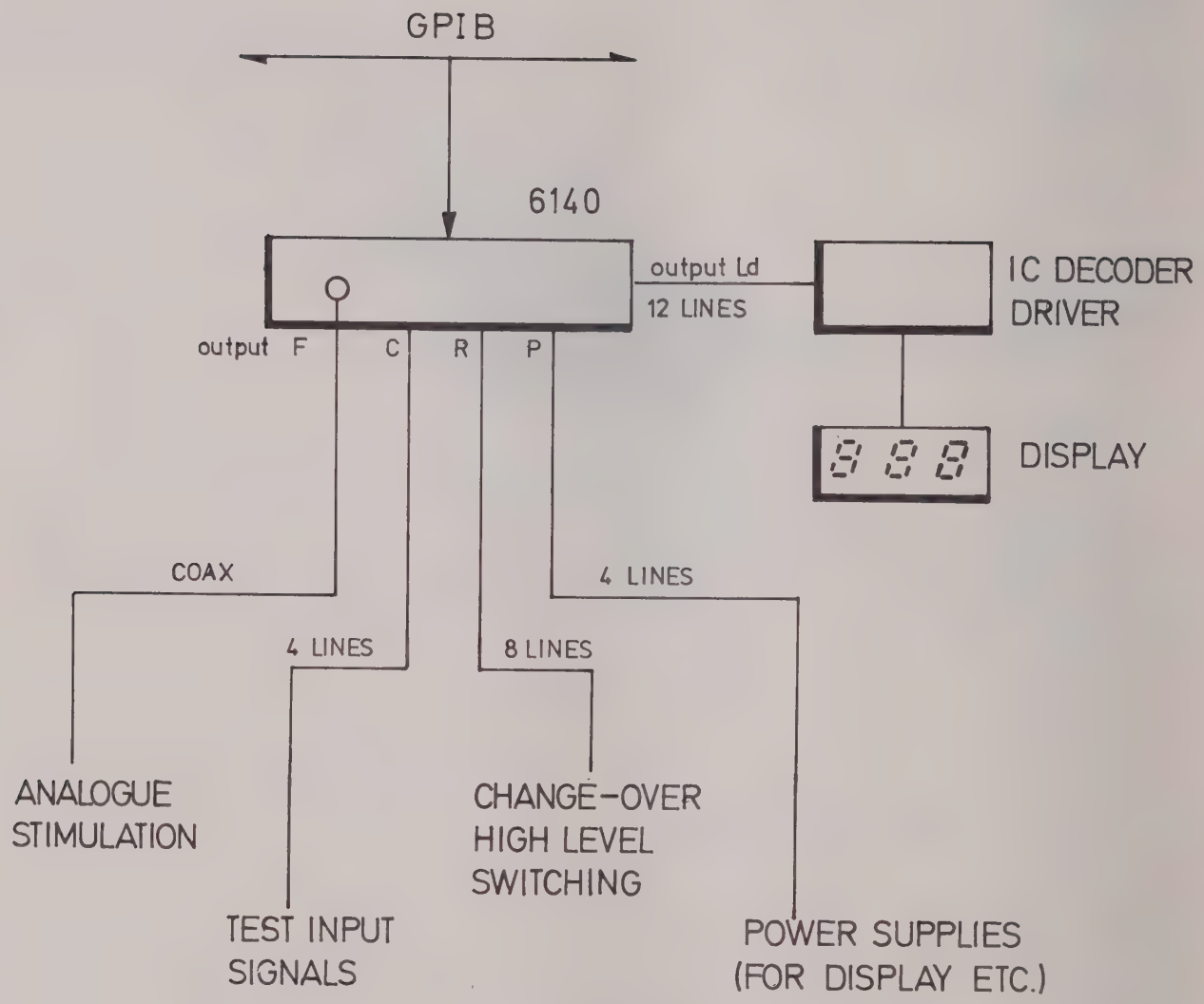


Fig. 15 GPIB Controller for Test Jigs

GPIB Control of Test Jigs

Fig. 15 shows a typical application of the Type 6140 for interfacing various test jig stimulii with a GPIB Controller.

Multiband Frequency Sweeper from GPIB Control

A series of octave band generators with analogue controlled frequency can be multiplexed and GPIB controlled. Fig. 16 shows a typical system.

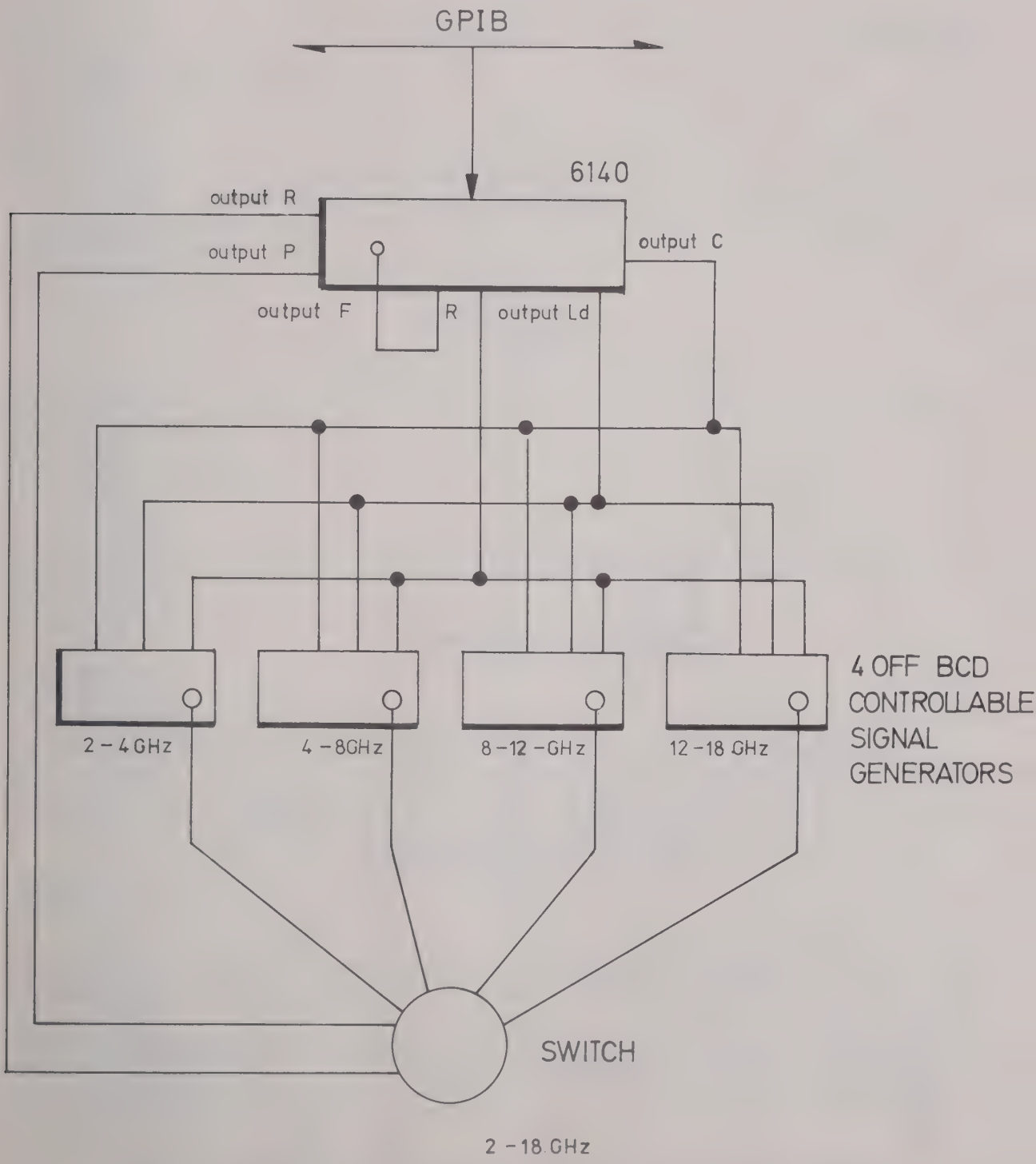


Fig. 16 GPIB Control of 4 BCD Controllable Signal Generators

Fine Tuning Using Increased Resolution

The 6140 has the internal facility to internally sum output L and output F. Provision has been made for the insertion of three additional pluggable resistors R48, R49 and R60 to achieve this.

$$\text{Step size for F} = \frac{R11}{10^7} V$$

$$\text{Step size for L on F} = \left(\frac{R11, R60 \times 10^{-2}}{R48, R60 + R48, R49 + R60, R49} \right)$$

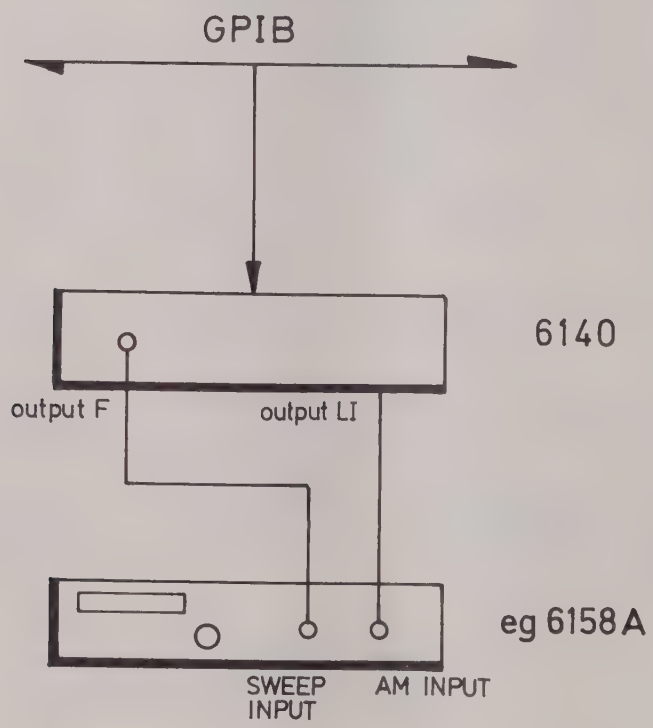


Fig. 17 GPIB Control of RF Level and Frequency

Chapter 4

TECHNICAL DESCRIPTION

CONTENTS

Para.
1 Power supply
2 Output control circuit
11 Handshake circuit

POWER SUPPLY

1. The power supply provides from conventional 3 terminal regulators the following supplies:-

+5V	0.5A
+15V	250mA
-15V	250mA
+24V	10mA

The grounds are floating, but diodes prevent large excursions when the control board is disconnected.

OUTPUT CONTROL CIRCUIT

2. The function of this board is to decode the data from the data bus into valid command letters and numeric data which can be used to control the appropriate analogue circuits.

LOCAL REMOTE MODE

3. At Switch On the 6140 goes into the local mode, the front panel indicator is lit. When the 6140 is addressed this indicator will go out; under control from the handshake board. If local lockout has been selected over the bus, the return to local button will be disabled by the handshake board. A status line (ext/Rem) is fed to the rear panel which informs external devices of the status of the 6140.

F OUTPUTS

4. This output is generated by two D A's IC20 and IC21, summed together to form a 4 digit BCD D A giving 10,000 pt resolution. Resistor R50 controls the significance of IC21 into the sum. IC20 provides a -10V reference which is used to give offset control to the F+ output via R46. Gain control is provided by R47. R11, the feedback resistor, is a selectable item which allows the output voltage range to be pre-selected. R48, R49 and R60 are also selectable, which allows the summing of L output with F output to give higher resolution. In the normal mode these resistors are omitted.

5. The data fed to the DA's may be obtained in one of two ways. Firstly in the local mode the CAL button is enabled by the release of TR2, which in turn enables the 50Hz clock from the power supply. If the CAL button is depressed, the data fed to the shift registers IC4, and IC5 is at logic 0. This data is then transferred to IC20 and IC21 via their appropriate latches, causing the F+ output to go to its lowest value. If the CAL button is not depressed, the data is high and the F+ output goes to the highest value. This enables the user in the local mode to set the range and offset at the F+ output.

6. Secondly, in the remote mode the data is decoded by IC6 and IC7 to determine whether the data is numeric or alphabetic. If the letter is an F, latches IC12, IC13 and IC14 are enabled and any numeric data following the letter F will be loaded into the shift register. On receiving a delimiter of comma or carriage return this data is loaded into the latches and consequently the F output.

7. The F- output always gives a 0 to -10V independent of the offset gain and range settings, this is because it is derived from the DA output before these controls.

L OUTPUTS

8. The L outputs are very similar to the F outputs, R15, 16, 17, 18, ICs 27 and 28 forming a 3 digit BCD DA, the output voltage being fixed at ±10V for the appropriate output L+ or L-. R51 and R52 control the significance of IC29 and IC28. The La output is generated from the L output by IC30. This is a constant current source referenced using R59 and is capable of giving up to 4V at 50mA. The 50mA corresponds to a maximum value of L, i.e. 999. This output has preset offset control R55 to set up zero current at L = ØØØ.

DATA OUTPUTS

9. The numeric data fed to the L output is also available to the user as output Ld, this data is buffered to allow 2TTL loads to be driven.
A pure numeric data output of 4 lines in a BCD format is available as the C output.
The final data output is "R output"; this is available as the buffered numeric data and as normally open relays arranged in a changeover format.
The relays have to be enabled by linking 44 to 19 on the rear panel socket. This link supplies power to the transistors which drive the relays, therefore when the power is removed, the relays will return to the open state. This facility is provided to enable the operator to use the numeric form of the R output, but not the relays, thus increasing the life expectancy of the relays.

POWER OUTPUT

10. The circuits on the control board (with the exception of IC22) use power rails at ±15V and +5V; these are available to the operator on the rear panel and are fully protected by the power supply regulators from short circuit.

HANDSHAKE CIRCUIT

11. All GPIB lines are connected to the Handshake PCB via connector SK4. Bus transceivers IC1, 2, 3 and 6 invert the low state inputs. The two GPIB lines that are outputs from the handshake board, NDAC and NRFD, are enabled and inverted by the bus transceivers. Generally, logic states between the transceivers which invert the bus signals and the inverters which drive the control outputs are positive. For decoding purposes, on both the handshake and data boards, seven inverted data lines are made available by inverters IC5a2, IC5b2 and IC11b3, in addition to the seven data lines in the normal (positive true) sense. Three GPIB lines are not used by this interface; these are SRQ and EOI and the most significant bit data line DIO8.

12. The GPIB controller asserts ATN when it begins a handshake cycle during which it will address the 6140 as a listener. ATN sets the output of OR gate IC19b4 to logic 1. Pin 9 of AND gate IC20b2 is logic 1, assuming that there is no DAV signal being sent. The logic 1 inputs to this AND gate cause the output at pin 8 to be logic 1. This output is inverted by IC15d4 and is the NRFD signal (not ready for data); which is passed to the bus transceiver. When the ATN signal is being received by the 6140, it is used to disable the NRFD signal, which is inverted by the bus transceiver for connection to the GPIB. The absence of the NRFD signal indicates to the GPIB controller that the 6140 is ready for data (in this case an address) on its data lines. The bus controller senses that the 6140 is ready for data and asserts that the data is valid by setting the DAV line low. The bus transceiver inverts this signal so that pin 6 of IC15c4 is set to logic 1. The charging of capacitor C15 via R4/7 introduces a delay of approximately 200nS before the output of IC23b3 goes to logic 0. The output of IC19d4 now becomes logic 0, which means that NDAC is unasserted. The controller senses that the data has been accepted and now removes the DAV signal. This action causes the NDAC signal to return to its asserted state and the NRFD signal (after a delay of 2µs from the acceptance of data), returns to its unasserted state.

13. Agreement between the address data and the preselected address is detected by the EXCLUSIVE NOR gates of IC4 and IC11a3. If the address data from the GPIB agrees with the preselected address, a logic 1 is present at IC8 pin 1, i.e. the MLA signal. When signals DAV and ATN are present, as in an address handshake cycle, an output is produced at IC20a2 pin 3. This signal, together with MLA, produces a logic 1 at pin 3, IC12a2 and also at pin 9 of IC18a4. If listen only has been selected, it can be seen that this signal could have taken the place of the addressing signal, as the listen only signal is also available at IC18a4 pin 9, via the OR gate IC21. The output of the NOR gate IC18a4 pin 10 goes to logic 0 when the input pin 9 is set to logic 1. If neither the interface clear signal (IFC), nor the unlisten address (UNL) have been selected, then all inputs to NOR gate IC16a2 are at logic 0. A logic 1 is produced at the output of this gate (pin 1). This output is referenced LADS (listener addressed state).

14. The listener addressed state is used to operate the addressed indicator LED which is driven by transistor TR1. It is also combined by the logic AND function with the DAV and ATN signals at IC17a2. The output is fed to the control board and used to ena le the acceptance of control data. The absence of this enable signal during a command cycle eliminates the possibility of the data board responding to GPIB command data.

15. The universal unlisten command is the code 0111111 which is used to remove all bus listeners from the listener addressed state. When the unlisten command is sent, the AND gate IC7 identifies the code and produces the unlisten signal, UNL. The presence of the bus signals DAV and ATN during the handshake produce a logic 1 at pin 3 of IC20. This signal and UNL produce a logic 1 at pin 11 of IC12a2 which resets the listener addressed bistable, IC16a2 and IC18a4.

16. The interface clear signal, IFC, can also reset the listener addressed bistable. This signal is passed from its GPIB transceiver to IC16a2 via the OR gate IC19a4.
The listener addressed bistable is reset at 'Switch ON' by the signal 'pon', generated while C16 charges via R5. The logic 1 at pin 3 of IC23a3 at 'Switch ON' passes via IC19a4 and IC16a2 to reset the listener addressed bistable. Schmitt trigger IC23a3 fires after approximately 200mS and its output falls to logic 0.

17. Remote control via the GPIB is decided by the state of the Local/Remote bistable, IC16b2 and IC18d4. At Switch ON, the signal from IC23a3 passes via OR gate IC19c4 to IC16b2 pin 10, and resets the Local/Remote bistable to Local. When the 6140 receives its listen address, the bus signal ATN, a logic 1 is present at IC12a2 pin 3. This signal is used to reset the Local/Remote bistable to remote via AND gate IC17b2. When the 'go to local' command and the ATN signal are present and the 6140 is in the listener addressed state, the logic 1 at IC14 pin 9 resets the Local/Remote bistable to local.

18. The bus code for the local lockout command, 0000001, is detected by IC9 and IC14. When the GPIB handshake signal ATN and the local lockout command are present, the logic 1 at IC14 pin 6 sets the local lockout bistable IC17b4 and IC18c4. Local lockout prevents the local request control on the 6140 from resetting the Local/Remote bistable. The local lockout bistable can be reset only in the absence of the remote signal REN, which normally is always asserted when the interface is under remote control; or it can be reset by switching the 6140 OFF and ON, to produce a 'pon' signal.

19. Operation of the LOCAL request button on the front panel of the 6140 produces a logic 0 at the return to local input. This signal is fed via the control board to pin 21 of the handshake board. (The input may be simulated for test purposes by linking this pin to earth). The return to local signal is gated by IC23c3 and IC17b2 and depends on the local lockout bistable being in the reset state, i.e. local request not locked out.

20. The clear command codes, 0010100 and 0000011, for device clear and selected device clear, are detected by IC9, IC10a2, IC11c3 and IC10b2. The device clear code and the presence of the handshake signal ATN are detected by AND gate IC10a2. The selected device clear code, the handshake signal ATN and the listener addressed state (LADS) are all required to produce the clear signal when the 6140 is cleared in this mode. The clear signal is fed to the output latches of the A2 data board. Upon receipt of either of the clear commands, all output data from the 6140 latches are removed.

Chapter 5

FAULT FINDING

CONTENTS

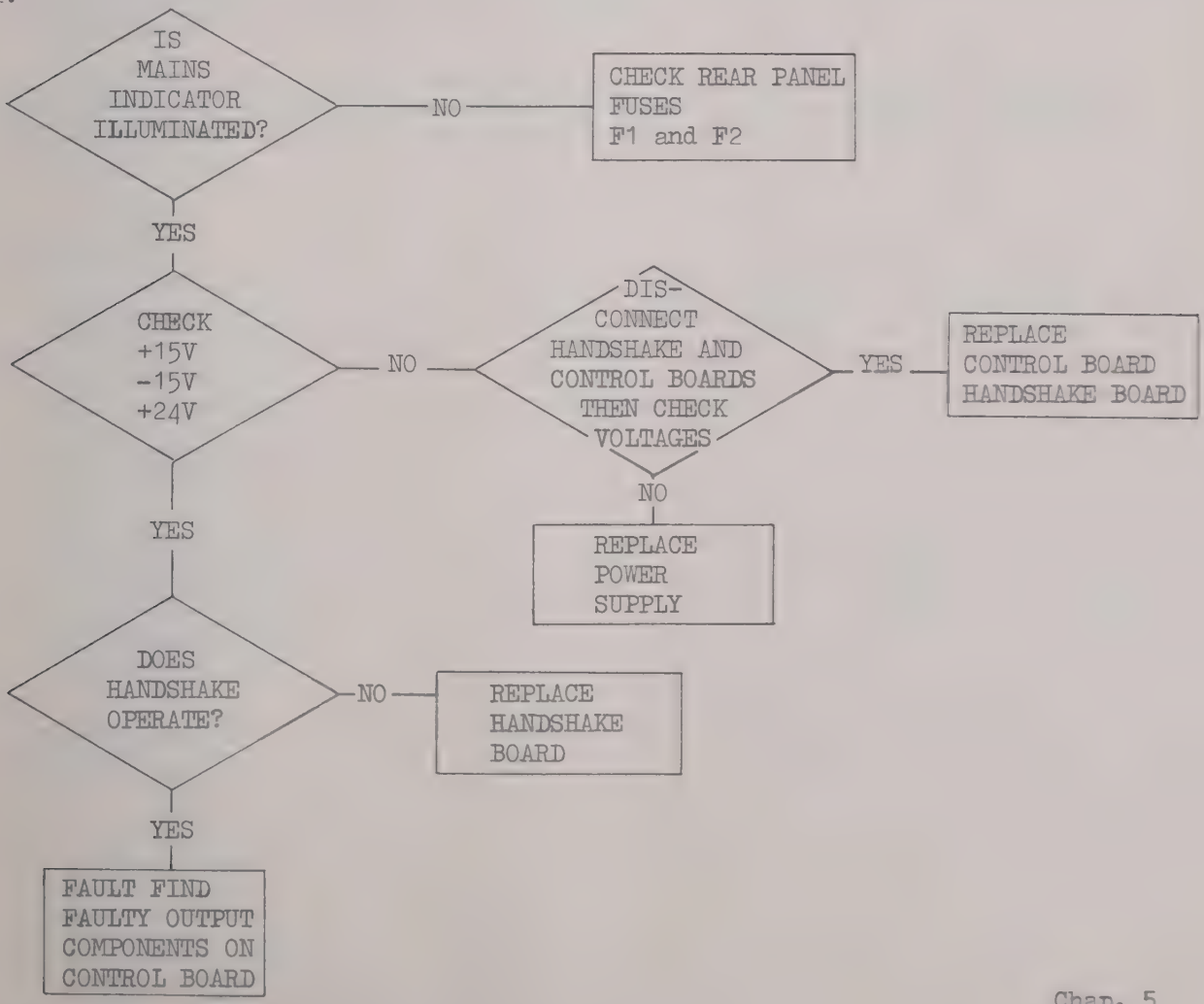
Para.
1 Introduction
2 Fault finding

INTRODUCTION

1. This chapter provides information required to fault find the equipment to component (PCB) board level.

FAULT FINDING

2.



Chapter 6

REPLACEABLE PARTS

CONTENTS

Para.
1 Introduction
3 Ordering
4 Abbreviations
5 Power supply PCB assembly
6 Output control PCB assembly
7 Handshake PCB assembly

INTRODUCTION

1. This chapter provides information for procuring replaceable parts for the Type 6140 GPIB ADAPTOR. Parts in each sub-assembly are listed in alpha-numerical order of component reference with miscellaneous parts at the end of each list. Abbreviations used are explained in para. 4.

2. While equivalent alternatives to some components may be included during manufacture, Marconi Instruments Ltd., Microwave Products Division, should be consulted before any other alternatives are fitted when the equipment is being serviced.

ORDERING

3. Send your order for replacement parts to our Technical Services Department. Specify the following information for each part required.

(1) Type and serial number of instrument.

(2) Circuit reference.

(3) Description.

Marconi Instruments Ltd.,
Microwave Products Division,
Gunnels Wood Road,
Stevenage SG1 2AU,
ENGLAND.

Telephone : Stevenage (0438) 2311
Telex : 82159
Cables : Sandelect Stevenage

Or contact your local Marconi Instruments, Microwave Products Division representative.

4.

TABLE 1 ABBREVIATIONS

amp	:	amplifier	lg	:	long
b.c.d.	:	binary coded decimal	m.f.	:	metal film
cer	:	ceramic	m.o.s.	:	metal oxide semiconductor
dia	:	diameter	p.c.b.	:	printed circuit board
d.i.l.	:	dual in-line	p.t.p.	:	polyester
elec	:	electrolytic	tant	:	tantalum
IC	:	integrated circuit	t.p.i.	:	turns per inch
ins	:	insulated	var	:	variable
l.e.d.	:	light emitting diode			

5. Power supply PCB assembly

Circuit Ref.	Description	Part No.
	Power supply p.c.b. assembly	3963/001
T1	Transformer	3963/009
S1	Mains switch (push button)	3865/046
	*Plug, bail mount, 50 way	23435-129P
	*Cover, strain relief, 50 way	23435-162D
	Protective cover	23416-198E
	Bail lock kit	23435-185J
R46	Resistor variable - Bourns 20K 0.5 watts	3059L-1-203M
R47	Resistor variable - Bourns 2KO 0.5 watts	3059L-1-202M
IC20	Integrated circuit, Hybrid Systems	DAC-349-B-3D
LED 1 LED 2 LED 3	Light emitting diode - Bulgin	D998 Yellow
FS1 FS2	Fuse link time delay 250mA	23411-045F
	Insulating kit	28488-129M
	Silicon compound	'SILICOSET' 151
R1 R2	Resistor fixed 100 ohm 0.25 watts	24773-249J
R3	Resistor fixed 220 ohm 0.25 watts	24773-257W
R4	Resistor fixed 4k2	Holco H8
* Alternative may be fitted:		
	Cable to panel plug	23435-4202

Circuit Ref.	Description	Part No.
C1 C2 C5 C8	Capacitor fixed elec. 2200µF 40V working	26415-831P
C3 C4 C6 C7 C9 C10 C13 C14	Capacitor fixed tant 47µF 35V working	26486-207L
C11	Capacitor fixed elec. 100µF 40V working	26423-244C
C12	Capacitor fixed elec. 100µF 63V working	26415-815N
D1 D2 D3	Diode bridge, International Rectifier	18DB 2A
D4 D5 D8	Diode rectifier IN 4004 400V working	28357-028K
D6 D7	Diode silicon IN 4148 100V working	28336-676J
IC1	Integrated circuit volt. reg.	28461-707G
IC2 IC3	Integrated circuit volt. reg. Motorola or Fairchild	78 M15 CP
IC4	Integrated circuit volt. reg. National Semiconductor	LM 317 MP
	Ribbon cable assy. No. 2	3963/005
	2 core screened & twisted cable	3963/006
	Connector	23434-134M
	Transistor pads	2488-124W

6. Output control PCB assembly

Circuit Ref.	Description	Part No.
	Output control PCB assembly	3963/002
R1 R2 R11 R25 R27 R28 R56 R57	Resistor fixed 10K 0.25 watts	24773-297M
R3 R5 R7 R14 R17 R37 R38 R39 R40 R41 R42 R43 R44 R45 R53	Resistor fixed 100K 0.25 watts	24773-321L
R4 R19	Resistor fixed 68 ohms 0.25 watts	24773-245U
R6	Resistor fixed 1M 0.25 watts	24773-346F
R8 R21	Resistor fixed 470K 0.25 watts	24773-337R
R10	Resistor fixed 9K1 0.25 watts	24773-296X
R12	Resistor fixed 22K 0.25 watts	24773-304C
R13	Resistor fixed 56K 0.25 watts	24773-315U
R15	Resistor fixed 24K 0.25 watts	24773-306B
R16	Resistor fixed 51K 0.25 watts	24773-314E
R18	Resistor fixed 200K 0.25 watts	24773-328D
R20	Resistor fixed 75K 0.25 watts	24773-318L
R9 R22 R23 R26	Resistor fixed 47K 0.25 watts	24773-313H
R24	Resistor fixed 390K 0.25 watts	24773-335M
R29 R30 R31 R32 R33 R34 R35 R36	Resistor fixed 8K2 0.25 watts	24773-295P
R50 R55	Resistor var. 5K 0.5 watts Spectrol 64W Allen Bradley 85W	502
R51	Resistor var. 200K 0.5 watts Spectrol 64W Allen Bradley 85W	204
R52	Resistor var. 20K 0.5 watts Spectrol 64W Allen Bradley 85W	203
R54	Resistor fixed 27K 0.25 watts	24773-307K
R58	Resistor fixed 1K 0.25 watts	24773-273A
R59	Resistor fixed 20 ohms 0.25 watts	24773-232X

Circuit Ref.	Description	Part No.
C1 C2	Capacitor fxd. ceramic disc 470pF 30V working	26383-018Y
C3 C5 C6 C8 C10 C13 C14 C16 C17 C23 C24 C25 C26 C27 C28 to C35	Capacitor fxd. ceramic disc 0.1µF 25V working	26383-006C
C4 C9 C11	Capacitor fxd. P.E.T.P. 0.22µF 100V working	26582-226G
C7	Capacitor fxd. ceramic plate 33pF 63V working	26343-471Y
C18 C19 C20	Capacitor fxd. tant disc 4.7µF 35V working	26486-219P
C36	Capacitor fxd. ceramic disc 1nF 500V working	26383-242P
D1 D2	Diode IN 4148 100V working	28336-676J
TR1	Transistor MPSA13 30V working	28453-842U
TR2 TR3 to TR10	Transistor BC108 20V working	28452-787N
TR11	Transistor - Mullard	BD 132
IC1	Integrated circuit 4001B	28466-207Z
IC2 IC10	Integrated circuit 4081B	28466-009L
IC3	Integrated circuit 4071B	28466-403P
IC4 IC5	Integrated circuit 4015B	28467-519D
IC6 IC7	Integrated circuit 4028B	28465-013B
IC8	Integrated circuit 4011B	28466-340R
IC9 IC11 to IC19	Integrated circuit 4042B	28462-404A
IC20	Static sensitive component fit on final assy	74L508
IC21 IC27 IC28	Integrated circuit Ferranti ZN425E	28469-381G
IC22	Integrated circuit Precision Monolithics	OP05CP
IC23 IC24 IC25 IC26	Integrated circuit 4050B	28469-161A
IC29 IC31	Integrated circuit 741	28461-304T
IC30	Integrated circuit dual op. amp. RCA Texas	 CA3240E TL082
RL1	Relay Hamlin	HE 721 A 05 10
RL2 to RL8	Astralux	121 A 4

7. Handshake PCB assembly

Circuit Ref.	Description	Part No.
	Handshake PCB assembly	3963/003
	Ribbon cable assy no.	3963/004
10	Connector	23435-133X
R1	Resistor pack 100K 0.25 watts	24681-601L
R2 R3 R4	Resistor pack 2K7 0.25 watts	24681-604G
R5	Resistor fxd. 1M 0.125 watts	24773-346E
R6 R7	Resistor fxd. 47K 0.25 watts	24773-313H
R8	Resistor fxd. 220 ohm 0.25 watts	24773-257W
R9	Resistor fxd. 4K7 0.25 watts	24773-289W
R10	Resistor fxd. 10K 0.25 watts	24773-297M
C1	Capacitor fxd. tant disc 4.7µF 35V working	26486-219P
C2	Capacitor fxd. ceramic disc 470pF 30V working	26383-018Y
C3 C4 to C14	Capacitor fxd. ceramic disc 0.01µF 25V working	26383-006C
C15	Capacitor fxd. polystyrene 560pF 350V working	26516-428M
C16	Capacitor fxd. P.E.T.P. 47µF 100V working	26582-215H
C17	Capacitor fxd. ceramic disc 1nF 500V working	26383-242P
TR1	Transistor BC108 20V	28452-787N
IC1 IC2 IC3 IC6	Integrated circuit Motorola MC3441AP	28469-166Y
IC4 IC11	Integrated circuit 4077	28466-213U
IC5	Integrated circuit 4049	28469-162Z
IC7 IC8	Integrated circuit 4048	28469-365A
IC9 IC16	Integrated circuit 4002	28466-210Z
IC10 IC14 IC17	Integrated circuit 4073	28466-008N
IC12	Integrated circuit 4081	28466-009L
IC13	Integrated circuit 4528	28468-308R
IC15	Integrated circuit 74LS05	28469-178D
IC18	Integrated circuit 4001	28466-2077
IC19	Integrated circuit 74LS32	28466-108U
IC20 IC22	Integrated circuit 74LS08	28466-012L
IC21	Integrated circuit 4071	28466-403P
IC23	Integrated circuit 4093	28469-203U

Chapter 7

SERVICING DIAGRAMS

CONTENTS

Para.
1 Circuit notes

Fig. Page
1 Schematic Circuit Diagram 3/4
2 Power Supply Circuit Diagram 7/8
3 Output Control PCB Circuit Diagram 7/8
4 Handshake PCB Circuit Diagram 9/10

CIRCUIT NOTES

Component valves

1. Unless otherwise indicated, resistor valves are given in ohms and capacitor valves in micro farads.

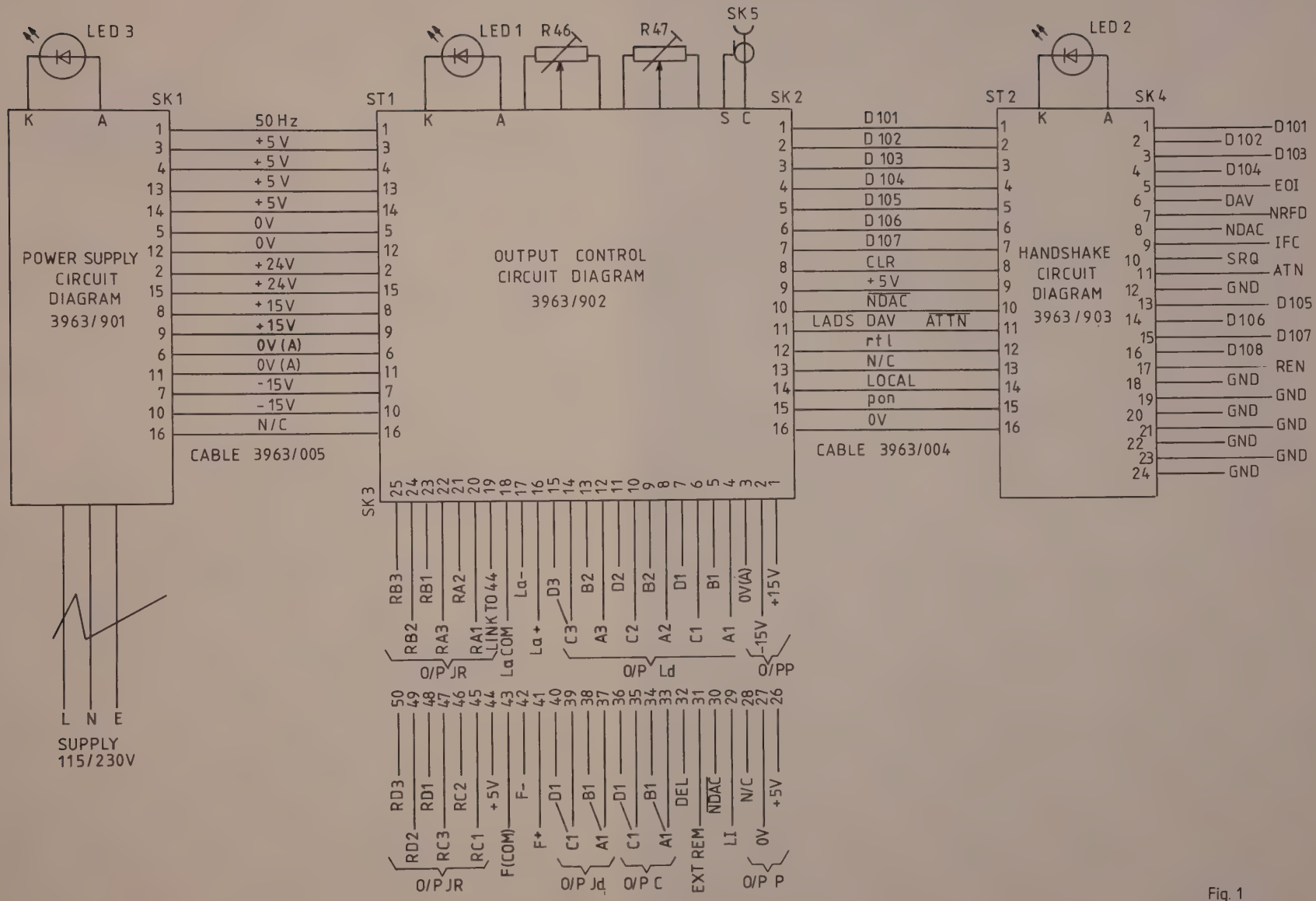


FIG 1 SCHEMATIC CIRCUIT DIAGRAM

FUSE TABLE		
VOLTAGE	115	230
FS1	500 mA	250 mA
FS2	500 mA	250 mA

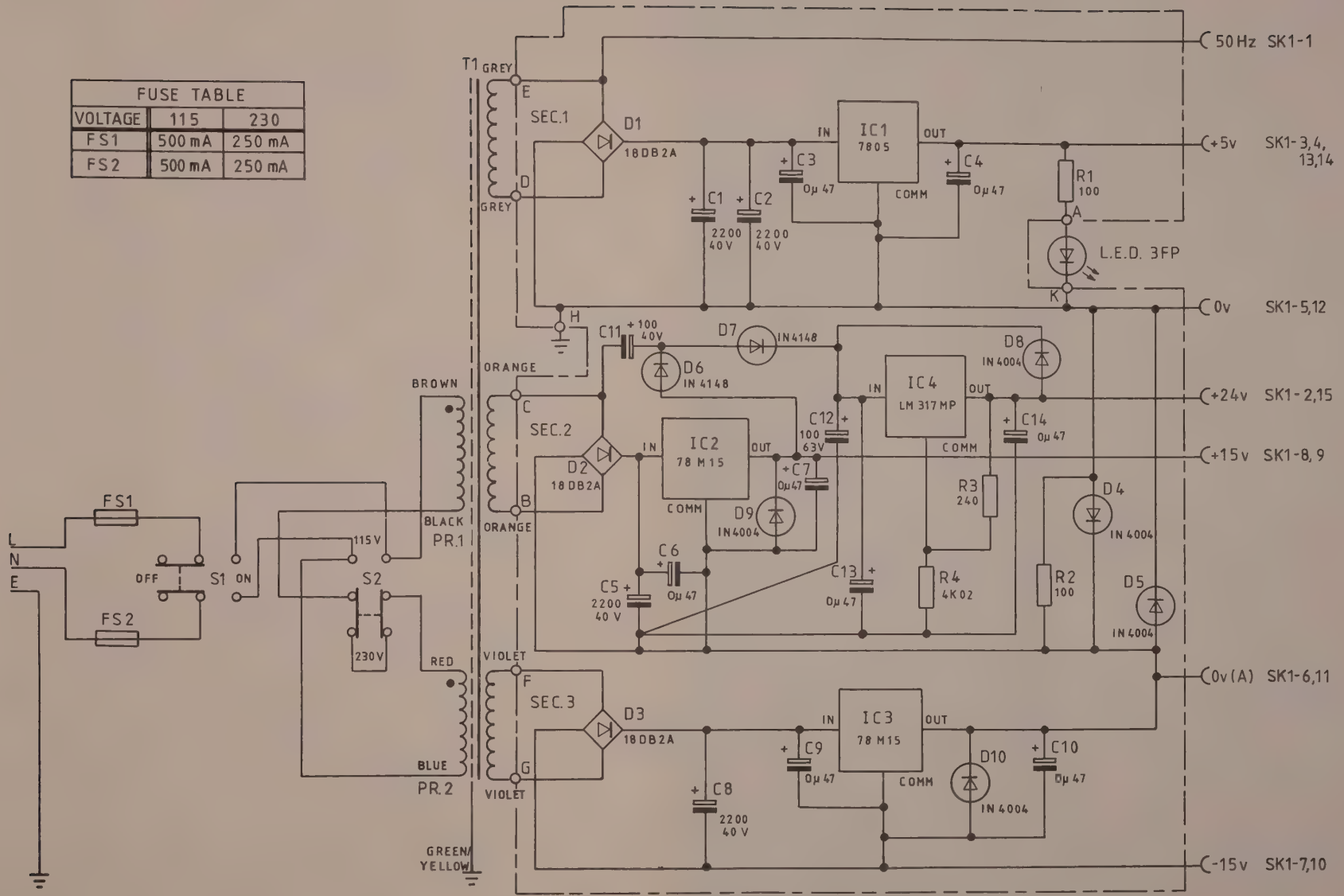
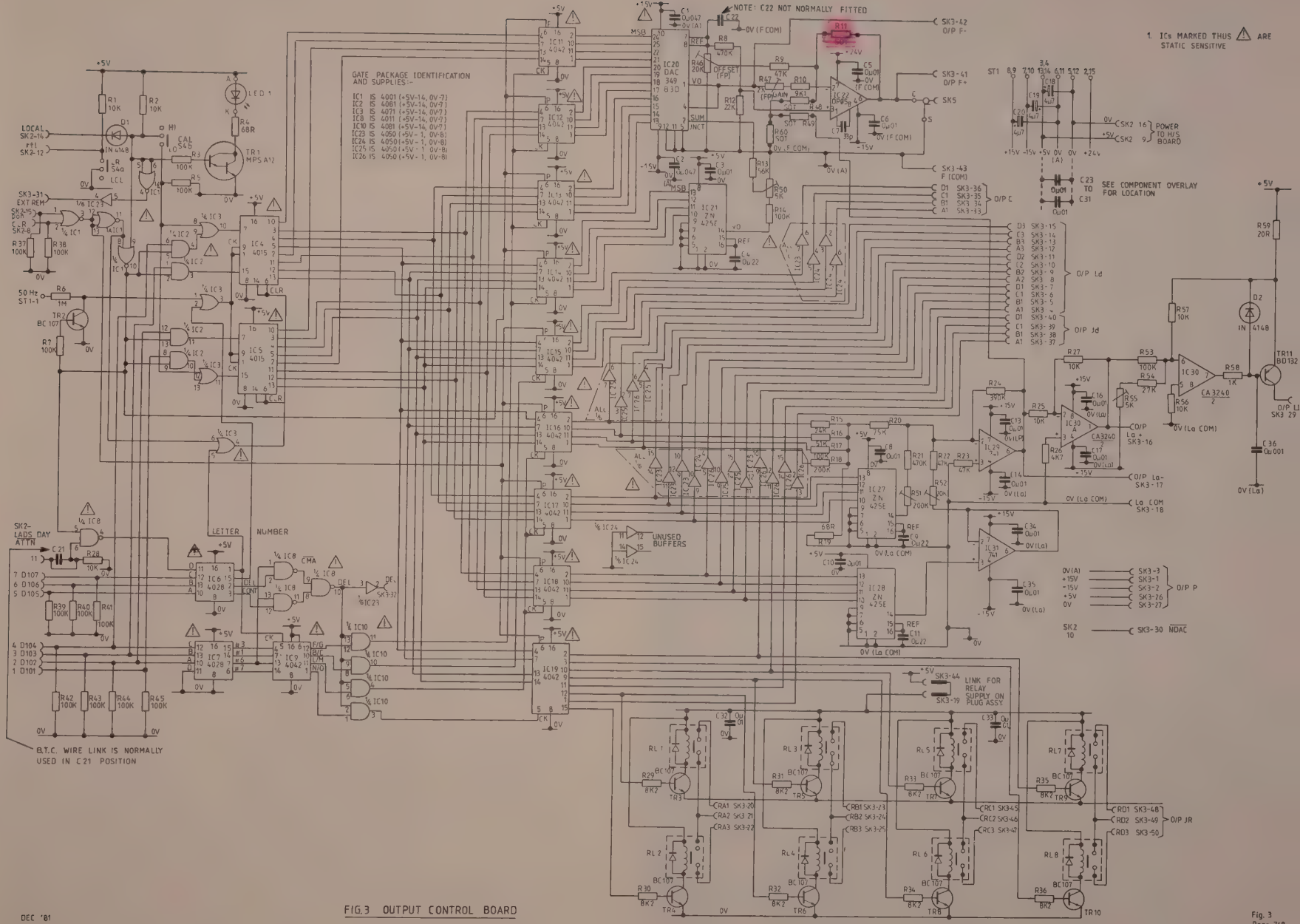


FIG.2 POWER SUPPLY


NOTE: C22 NOT NORMALLY FITTED
1. ICs MARKED THUS ⚠ ARE STATIC SENSITIVE
GATE PACKAGE IDENTIFICATION AND SUPPLIES:-
IC1 IS 4001 (+5V-14, 0V-7)
IC2 IS 4081 (+5V-14, 0V-7)
IC3 IS 4071 (+5V-14, 0V-7)
IC8 IS 4011 (+5V-14, 0V-7)
IC10 IS 4081 (+5V-14, 0V-7)
IC23 IS 4050 (+5V-, 0V-8)
IC24 IS 4050 (+5V-, 0V-8)
IC25 IS 4050 (+5V-, 0V-8)
IC26 IS 4050 (+5V-, 0V-8)
LOCAL SK2-14
SK2-12
SK3-31 EXT REM
SK2-5 DSR
SK2-8 C-R
50 Hz ST1-1
SK2- LADS DAY ATTN
LETTER
NUMBER
B.T.C. WIRE LINK IS NORMALLY USED IN C21 POSITION
UNUSED BUFFERS
LINK FOR RELAY SUPPLY ON PLUG ASSY
SEE COMPONENT OVERLAY FOR LOCATION
POWER TO H/S BOARD
O/P F-
O/P F+
O/P C
O/P Ld
O/P Jd
O/P La+
O/P La-
O/P P
O/P JR
DEC '81
FIG.3 OUTPUT CONTROL BOARD
Fig. 3
Page 7/8

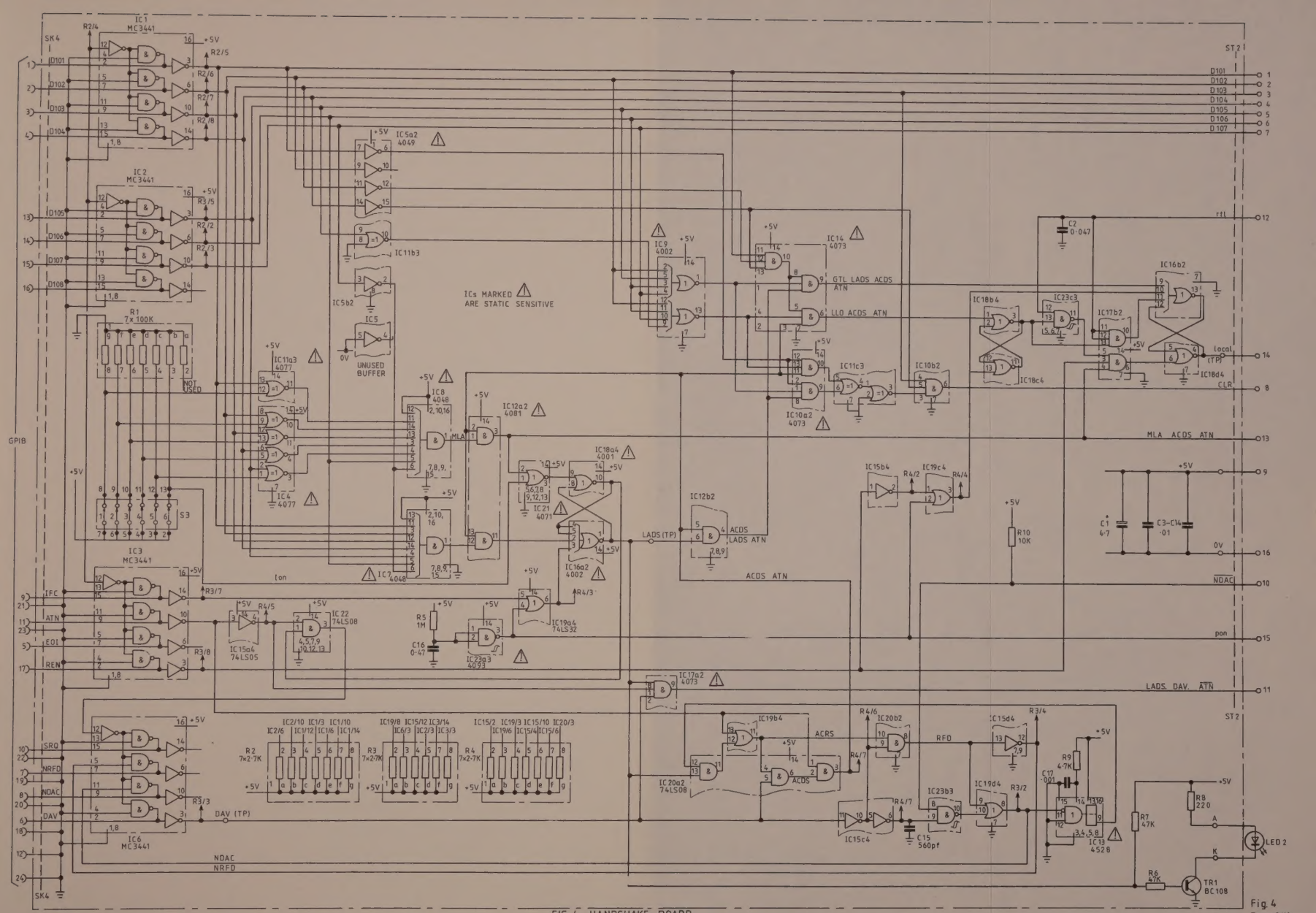


FIG. 4 HANDSHAKE BOARD

6140

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MP MASTER
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